Agronomy Research **16**(4), 1862–1876, 2018
https://doi.org/10.15159/AR.18.153

Human factors and ergonomics in safety management in healthcare: building new relationships

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Abstract. Human factors are playing an essential role in ensuring occupational health and safety at work. In the healthcare sector, relevant factors include optimizing the interaction of humans with their technical, social working environment, and human characteristics such as knowledge and motivation. Those factors affect the ability to provide good quality of healthcare and safety performance. The aim of this paper is to analyse factors related to safety knowledge, communication and professional competence among caregivers in nursing homes. A group of professionals studied (n = 241, includes nurses and caregivers) completed a validated questionnaire. Descriptive statistics and correlation analyses were applied, using SPSS Statistics 24.

Our study revealed that over half of the respondents possess an occupational certificate and the majority of employers organize regular in-service training at workplaces. Respondents who claimed that in-service trainings are not regular still stated that they generally receive safety and ergonomic related trainings, trainings for working with special equipment. However, only a quarter of respondents have access to occupational safety trainings that focus on specific risks at work.

Based on the results of the study, we emphasize the need of integrating human factors in the safety management system in nursing homes with a special focus on adequate safety training in order to develop necessary skills and knowledge of workers. This would enhance employees' ability to cope successfully with the elderly and people with special needs, to provide safe and high-quality care as well as confidence and the knowledge how successfully they manage conflicts in order to keep good relationships at work.

Key words: competences, healthcare, training, workplace safety.

INTRODUCTION AND THEORETICAL BASIS

Human factors and ergonomics (HFE) are playing an essential role in ensuring occupational health and safety at work that influence workers and their behavior in work-related situations. The need for addressing those factors in healthcare has been recognised by many researchers (Hignett, 2003; Carayon, 2006; Hignett et al., 2013; Valdez et al., 2017). The main topics include optimizing the interaction of humans with their working environment (technical, physical, organizational and social working environment (team, supervisors, culture)) (Moray, 2000), human characteristics such as ability, knowledge, motivation of workers, and commitment to organization (Dul et al.,

2012). Management of HFE factors contributes to good quality of healthcare, improvement of patient safety (Carayon, 2010) as well as the prevention of occupational incidents and accidents within the healthcare organization. HFE focuses on the integrated system that includes interaction of humans with their working environment, and whereas in healthcare it is a complex system and environment (Carayon, 2006), focusing on both - on the employee (caregivers) and their safety as well as on a care receiver (patient safety) (Hignett et al., 2013).

In the healthcare, successful safety management within the organization requires the development of safety policies, procedures and structures, followed by the employees as well as a common understanding shared by senior managers and employees that safety is vital for overall performance. In addition, HFE tools and methods are also recommended by researchers (Goodman, 2010; Gutberg & Berta, 2017) as a part of interventions in order to improve patient safety.

The focus of HFE is generally on the improvement of well-being and performance by implementing a hierarchical approach. The improvement of the working environment through systems design is seen as the priority, followed by integrating the human into the system, selecting workers and an effective training that enhances social exchange and organizational learning (Christian et al., 2009) and creates a strong safety culture (Hadjimanolis & Boustras, 2013; Griffin & Hu, 2013).

In today's modern world, researchers emphasize the importance of the development of human resource, professional empowerment and competence of nurses and caregivers in healthcare systems in terms of safety and quality of nursing care (Heydari et al., 2016). Professional competency of nurses composed the central component of a set of skills, knowledge, attitudes, values, and self-efficacy (Levett-Jones et al., 2011), which can elevate nurses' and caregivers' positions among multi-professional teams within healthcare organizations. According to Chang et al. (2012), workers' competency is generally influenced by professional knowledge, reserved work experience, and personal attributes such as change skills, communication skills, qualifications, and experience (Chang et al., 2012) and is strongly related to errors and consequences (Axley, 2008). In addition, Epstein & Hundert (2002) revealed that professional competency might be evaluated according to correct judgment, practice and developed habits in terms of skills used, knowledge, clinical reasoning, shared values, communication, and daily activities.

Inside the organizations, continuous workers training plays also an essential role for health caregivers. The study by Nilsson with colleagues (2014) revealed that acquiring essential competencies by nurses is vital for the quality of everyday nursing practice. The competence level of nurses and training supports them to fulfil their duties effectively, safely, and directly influences the employees' and patients' safety, satisfaction with nursing care and conflict managements (Chan et al., 2014; Ahanchian et al., 2015; Heydari et al., 2016). Organizational learning, teamwork in the unit, feedback, learning from mistakes, communication and blame-free environment are strongly related to patient safety as well as to safety generally (Al-Ahmadi, 2009; Alswat et al., 2017). In healthcare, learning plays a vital role to offer a good quality of care (Ratnapalan & Uleryk, 2014). Legislation points out that training is a meaningful activity for risk prevention and safety and a key component that helps to the change workers' attitudes toward safety and understand their safety responsibility (Grau et al., 2002) and provide organizational effectiveness by HFE (Hignett, 2003; Carayon, 2006; Hignett et al., 2013; Valdez et al., 2017).

Development of professional competence of nurses is meaningful particularly for caregivers who are a part of the hospital system, representing it for patients and their family (Steginga et al., 2005; Ratnapalan & Uleryk, 2014) and providing patient care and living quests. Many scholars report that representatives of this specialty do not, in general. have professional and formal education and enough skills to provide quality care for elderly, sick people or for people with special needs (Salonen, 2009; USDHHS, 2014). Providing good care of patients often involves cognitively and physically difficult work with many work-related psychosocial risk factors, such as quantitative (work load) and emotional demands, workplace and role conflicts that may contribute to high levels of stress as well as burnout amongst nurses (Freimann & Merisalu, 2015). Chang et al. (2012) have found a strong relationship between safety prevention and health hazards, and between safety, health training in a healthcare organization.

Despite many healthcare studies that focus on the efficacy of treatment and practices as well as the importance and relevance of HFE in healthcare, there is a potential for the development of professional competence of nurses and caregivers. In this respect, lack of attention to professional competency of nurses and caregivers can cause problems for healthcare organizations, for example, nurses' poor competency may lead to some undesirable consequences, including nurses' frustration, job dissatisfaction, low job attitudes, including lack of organizational commitment and professional affiliations (Dul, et al., 2012; Hignett et al., 2013; Rajabipour Dehghani, 2013). For those reasons, it is relevant to investigate how human factors are integrated in the current safety management system in healthcare, particularly in nursing homes, in order to understand the interactions among humans and other elements of the system. We examined the relationship between caregivers' professional competency, obtained education and maintained qualifications, safety knowledge, communication, and commitment to safety.

In this article, we share Carayon' (2010) concepts and consider HFE as an innovation that each healthcare organization requires. In particular, focus is on general HFE knowledge provided to its workers, and follows an analytical framework proposed by Carayon et al. (2006) to consider how different components of the system can influence employees' commitment, attitudes and perceptions towards safety in a healthcare organization.

The aim of this paper is to analyse factors related to safety knowledge, communication, commitment to safety and professional competence among nurses and caregivers in nursing homes. We presume that the study will contribute to designing an interactive learning environment, an effective safety training and learning possibilities to integrate HFE into the in-service training activities in healthcare organizations.

MATERIAL AND METHODS

The study group

A simple random was selected from caregivers employed at seven nursing homes in Estonia. In total, 362 questionnaires were sent to nursing homes. The respond rate was 66.6%. Demographic data of the sample are presented in Table 1. It shows that among 241 respondents, 3 or 1.24% were males while 236 or 97.9% were females; information about the gender of one respondent is missing (0.8%). The distribution of respondents according to their age groups shows that 95 employees, composing 39.4%, are in the age group 48–57, followed by 56 employees or 23.2% who are in the age group 58–67,

44 respondents or 18.3% and 29 respondents or 12.1% are in the age group 38–47 and group 28–37, respectively. The rest of 7.1% respondents were spread between the group 18–27 (10 respondents or 4.2%) and the group older than 68 (6 respondents. 2.5%), 1 answer is missing (0.4%). More than a half of the respondents (55.61%) are caregivers, the rest of the respondents are nurses (44.39%) who are engaged in care work in nursing homes.

Table 1. Background information of study participants (n = 241)

Demographic variables	Category	Frequency	Proportion
Gender *(n = 241)*	Male	3	1.24
	Female	236	97.93
	Missing	2	0.83
Age *(n = 241)*	18–27	10	4.15
	28–37	29	12.03
	38–47	44	18.26
	48–57	95	39.42
	58–67	56	23.24
	68 and above	6	2.49
	Missing	1	0.41
Occupation *(n = 241)*	Care givers	133	55.61
	Nurse	108	44.39

Methods

The data were collected during the period of January – May 2017. The questionnaire was compiled according to Estonian National Occupational Standard for Care workers (Level 4, the highest level for professional competence of caregivers in Estonia). In order to explore caregivers' perceptions for the educational preparation according to the caregivers' occupational standard that establishes the requirements for working in nursing homes. The questionnaire includes six scales: Scale1 'Necessary skills, knowledge in living quests and patient care'; Scale2 'Necessary skills, knowledge for coping with the elderly and people with special needs'; Scale3 'Communication skills'; Scale4 'First aid'; Scale5 'Professionalism'; Scale6 'Commitment to safety'. Scale6 is not included into the national occupational standard for caregivers. Therefore, we complemented the questionnaire with this issue. The questionnaire was tested in both languages (Estonian and Russian) in two different nursing homes, revised and changed according to the results of piloting.

Description of created scales

The current diagnostic tool was tested for validity and reliability (Table 2). Cronbach α is an estimator of internal consistency. Cronbach alpha provides an assessment of questionnaire consistency; however, values may vary from one, which means best reliability and reliability to zero, which means that reliability is missing. Table 2 illustrates the high and statistically significant reliability coefficient of the following factors: 'Necessary skills, knowledge in living quests and patient care', 'Necessary skills, knowledge for coping with the elderly and people with special needs', and 'Commitment to safety'.

Cronbach's alpha for Scale1 is 0.897, which indicates a high level of internal consistency for this scale. To measure the variable 'Necessary skills, knowledge in living quests and patient care', a combination of questions from 1 to 10 was selected. Cronbach's alpha for Scale2 is 0.877, which indicates a high level of internal consistency for the Scale. To measure the variable, the combination of questions from 11 to 17 was selected. Cronbach's alpha for Scale6 'Commitment to safety' is 0.845, which indicates a high level of internal consistency for the scale. To measure the variable, the combination of questions from 26 to 31 was selected. As the other scales: 'Communication skills', 'First aid' and 'Professionalism' are defined by short lists of questions, the Cronbach's alpha was not calculated for them. But the analyses of the correlation between the questions of these scales were conducted.

As Scale1, 2 and 6 have high and statistically significant reliability coefficient (Table 2), the results of variations of the questions for Scale1, 2 and 6 are described in detail below.

Table 2. Reliability coefficients of the questionnaire for Scales1, 2 and 6

Scale	Cronbach α	M	SD
Scale1. Necessary skills, knowledge in living quests and patient care	0.897	43.42	5.77
Scale2. Necessary skills, knowledge for coping with the elderly and people with special needs	0.877	30.13	3.906
Scale6. Commitment to safety	0.845	25.59	3.806

The results for all specific factors used in the questionnaire are presented in Table 3.

Table 3. Results for the specific factors entered into the analyses

		Scale1	Scale2	Scale3	Scale4	Scale5	Scale6
N	Valid	236	240	241	238	240	234
	Missing	215	211	210	213	211	217
Mean		4.34	4.30	4.09	4.12	4.31	4.27
Std. Error of Mean		.038	.036	.048	.046	.043	.042
Median		4.50	4.43	4.00	4.00	4.33	4.33
Minimum		1.70	1.43	1.00	1.33	1.33	1.00
Maximum		5.00	5.00	5.00	5.00	5.00	5.00

Multiple modes exist. The smallest value is shown.

Respondents' opinions and perception were assessed using a five-point scale. The analyses were prepared using SPSS Statistics 24.0.

All respondents were informed about the aim and procedures of the survey. Every effort was made to ensure the protection of the privacy, confidentiality, and anonymity of individuals and organizations participating in this study.

RESULTS AND DISCUSSION

The first section discusses our general findings, such as results of the analyses of data about the occurrence of occupational disease, workplace stress and availability of safety-related and other additional training among respondents. The second section presents the main results of the study, followed by conclusions and our recommendations.

General findings

Our results revealed that 14.6% of respondents have been diagnosed with occupational diseases, 10% have experienced an occupational accident and 87.9% of the caregivers and nurses claim that their job is stressful (Table 4). Another study conducted by Sepp et al. (2015) in Estonian nursing homes demonstrated that work intensity, lack of time and social support, as well as difficulties in communication with patients influence caregivers' health and well-being.

Our findings also showed that over half (51.7%) of the respondents possess an occupational certificate, which gives a strong reason to credit that those workers may succeed with patient care more effectively than workers without specific vocational training.

Table 4. Characteristics of occupational health and safety aspects among respondents (%, proportion of respondents)

Age group	Occupational disease	Occupational accident	Occupational certificate	Stressful work
Total	14.6	10	51.7	87.9
18–27	-	10	40	60
28–37	24.1	24.1	41.4	82.8
38–47	6.8	9.1	47.7	90.9
48–57	14.7	5.3	48.4	90.5
58–67	17.9	12.5	69.6	87.5
over 68	20	-	33.3	100

Concerning additional trainings reserved by the respondents, the results showed that the majority of employers (82.5%) organize regular in-service training at workplaces (Table 5). Employees who receive regular in-service trainings claimed that those trainings consisted of the following topics: occupational risk and safety, ergonomics, working with special equipment as well as general safety trainings (e.g., fire safety, emergency, evacuation).

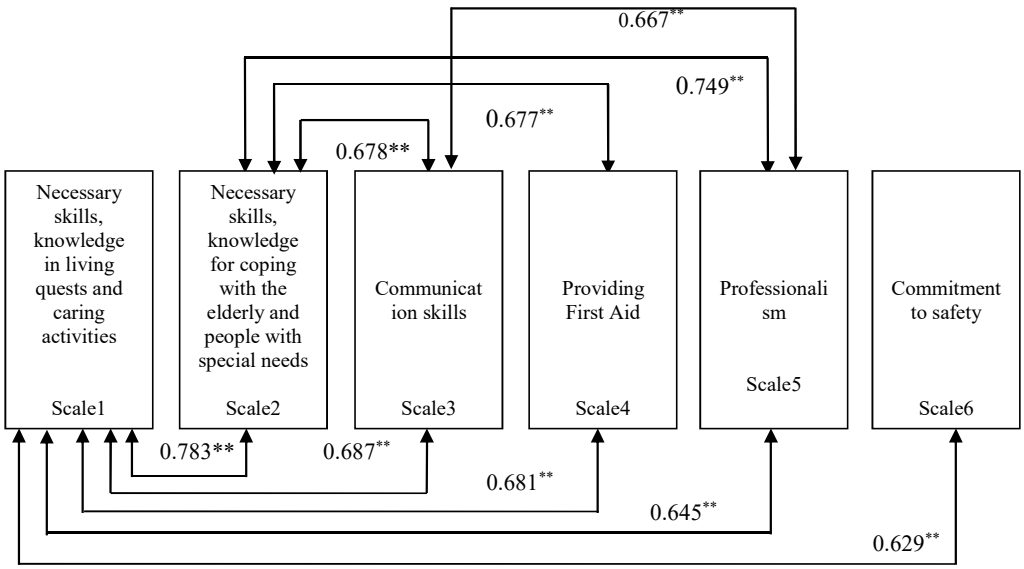
Table 5. Results about in-service trainings organized by employers (%, proportion of respondents)

In-service trainings	Respondents' rate
Employers organize regular in-service trainings	82.5
Employers organize occupational risk and safety trainings	79.5
Employees receive ergonomics-related trainings	75.8
Employees receive trainings for working with special equipment	82.9
Employers organize safety trainings (e.g., fire safety)	92.5

It is vital to have regular in-service training in order to strengthen safety behavior, commitment to safety and to improve knowledge about relevant requirement at work. Results of a study by Blair (2004) have demonstrated the core components of safety competency, such as ability to communicate effectively, to accept personal responsibility, to be able to implement and to transport solutions into action, to listen actively and to care, to assess and to evaluate safety effects, to maintain and to share a safety vision, to set goal, and to plan strategic actions. These competencies can be seen as an indicator for human resources development and management and for the development of safety and health training programs (Chang et al., 2012). Trainings for employees need to be planned carefully in order to be practical and effective, to be focused on employees' tasks and everyday work in order to improve workers' skills, performance and quality of working life (Orpen, 1993), their perceptions of quality and safety of care (Gurses et al., 2009).

Relationships between factors

According to our expectations, we found a strong positive correlation (r = .783) at significance level 0.001 between factors Scale1 'Necessary skills, knowledge in living quests and patient care' and Scale2 'Necessary skills, knowledge for coping with the elderly and people with special needs' (see Fig. 1). It means that respondents with higher estimation of their skills, knowledge in living quests and patients care have also higher confidence that they have enough skills, knowledge for coping with the elderly and people with special needs. Professional competency has been proposed as an essential element in the provision of healthcare also by other researchers, for example, Karimi et al. (2017) stated that developing professional competency and organizational commitment is essential for the high-quality and safety in healthcare.



**Statistical significance $p = 0.001$.

Figure 1. Correlations between scales.

In addition, Scale1 ‘Necessary skills, knowledge in living quests and patient care’ has also moderate positive correlations at significance level 0.001 with all other factors Scale3 ‘Communication skills’ (r = .687), Scale4 ‘First aid’ (r = .681), Scale5 ‘Professionalism’ (r = .645) and Scale6 ‘Commitment to safety’ (r = .629). Correlation between Scale1 ‘Necessary skills, knowledge in living quests and patient care’ and Scale3 ‘Communication skills’ shows that confidence in own knowledge and skills about patient care and living quests influences positively employees’ ability to communicate with patients and to find solutions for managing work-related conflicts. Correlation between Scale1 ‘Necessary skills, knowledge in living quests and patient care’ and Scale4 ‘First aid’ shows that employees who estimate their professional skills and knowledge higher than others feel more confident even in emergency situations. Respondents who perceive themselves as a professional with necessary skills and knowledge are more confident about their skills and knowledge also in living quests and patient care. This is confirmed by moderate positive correlation between Scale1 ‘Necessary skills, knowledge in living quests and patient care’ and Scale5 ‘Professionalism’.

Positive moderate correlation between Scale1 ‘Necessary skills, knowledge in living quests and patient care’ and Scale6 ‘Commitment to safety’ may be a reason why respondents who have high estimation of their skills and knowledge tend to be more committed to safety. Vice versa, employees who are more committed to safety have also higher estimation about their knowledge and skills in living quests and patient care. There is also strong positive correlation (r = .749) between factors Scale2 ‘Necessary skills, knowledge for coping with the elderly and people with special needs’ and Scale5 ‘Professionalism’. This means that employees with higher professionalism have higher estimations about their skills and knowledge for coping with the elderly and people with special needs. In addition, Scale2 ‘Necessary skills, knowledge for coping with the elderly and people with special needs’ has also moderate positive correlations with other factors, for instance, Scale3 ‘Communication skills’ (r = .678), Scale4 ‘First aid’ (r = .677), and Scale6 ‘Commitment to safety’ (r = .607).

Moderate positive correlations at significance level 0.001 were obtained between factors Scale3 ‘Communication skills’ and Scale1’ Necessary skills, knowledge in living quests and patient care’ (r = .687), Scale3 ‘Communication skills’ and Scale2 ‘Necessary skills, knowledge for coping with the elderly and people with special needs’ (r = .678), Scale3 ‘Communication skills’, and Scale5 ‘Professionalism’ (r = .667). This means that respondents with higher estimation of their professional knowledge are more confident in communication and willing to be able to solve conflicts more effectively than those employees who estimated those competences lower. These results prove the fact that effective training for health caregivers contributes to many critical aspects during work situations of caregivers and nurses. According to studies by Conner (2014) and Karami et al. (2017), continuous education is also recommended in order to strengthen professional competence of healthcare workers as well as to improve their confidence regarding everyday activities and practice (Orpen, 1993; Steginga et al., 2005), to improve their knowledge about safety, safe and direct patient-centred care (Lakanmaa et al., 2015) as well as enhance job satisfaction and commitment to organization. Another study (Han & Chung, 2015) has demonstrated that health caregivers’ organizational commitment is a vital precondition for the reduction of negative consequences, such as conflicts, exhaustion and turnover within health organization, as well as for mainenance

of friendly relationships with co-workers and of patients' health through a positve and supportive relationship to patients (deeper commitment to patients) ad to their families.

Factor Scale4 'First Aid' has moderate positive correlations with factors Scale1 'Necessary skills, knowledge in living quests and patient care' (r = .681) and Scale2 'Necessary skills, knowledge for coping with the elderly and people with special needs' (r = .677) at significance level 0.001. It can be explained that respondents who have high estimation on their knowledge and skills in living quests and patient care, and on skills and knowledge for coping with the elderly and people with special needs are also more confident in their readiness to provide first aid. Respondents who have doubts about their skills and knowledge described in Scales1 and 2 have also doubts in their ability to provide first aid.

There is also moderate positive correlations at significance level 0.001 between factor Scale6 'Commitment to safety' and Scale1 'Necessary skills, knowledge in living quests and patient care' (r = .629), and Scale6 'Commitment to safety' and Scale2 'Necessary skills, knowledge for coping with the elderly and people with special needs' (r = .607) (Table 6). It shows that respondents who have sufficient knowledge and skills required for their work are more likely to contribute to effective cooperation with management and/or with other co-workers in questions related to occupational safety.

Table 6. Relationships between different professional competences of caregivers in Estonia

	Scale	Scale1	Scale2	Scale3	Scale4	Scale5	Scale6
S1	Necessary skills, knowledge in living quests and patient care		.783**	.687**	.681**	.645**	.629**
S2	Necessary skills, knowledge for coping with the elderly and people with special needs			.678**	.677**	.749**	.607**
S3	Communication skills				.593**	.667**	.563**
S4	First aid					.574**	.345**
S5	Professionalism						.536**
S6	Commitment to safety						

**Statistical significance $p = 0.001$.

Caregivers' perceptions of their knowledge

Scale1 'Necessary skills, knowledge in living quests and patient care' was measured in the questionnaire by 10 questions (questions 1 to 10). Parameter Scale1 in Table 7 summarizes the results of selected variables included into the factor. The mean of summarized Scale1 variable is 4.34, which is 86.8% of the maximum. The highest level in this scale has question 10, question 8 showed the lowest level. This means that respondents estimate highly their knowledge and skills on patient hygiene and coping in daily life, but they do not feel confident enough to organize patients' social, rehabilitation and health services. These results indicate that in-service training and vocational training may not give sufficient knowledge to understand fully the system of healthcare with a large spectrum of different tasks, which would be essential in order to be able to give professional advice on clients' special needs as well as to organize an appropriate patients' activities by nurses and caregivers.

Table 7. Results of selected variables from Scale1 'Necessary skills, knowledge in living quests and patient care' of the caregivers' professional competences

Questions			Questions									
	Mean	SD	1	2	3	4	5	6	7	8	9	10
1 safe environment	4.32	.824										
2 nursing	4.48	.713	.634**									
3 theory to practice	4.39	.830	.488**	.698**								
4 patient knowledge	4.20	.785	.522**	.481**	.426**							
5 safe medicine taking	4.44	.795	.351**	.532**	.455**	.423**						
6 risk of medicines	4.30	.854	.391**	.449**	.431**	.460**	.746**					
7 helping the nurses	4.46	.737	.344**	.447**	.357**	.416**	.555**	.566**				
8 health services	3.94	.936	.382**	.324**	.368**	.471**	.417**	.457**	.507**			
9 relatives' consulting	4.26	.808	.453**	.488**	.453**	.559**	.493**	.585**	.434**	.541**		
10 patients' hygiene	4.58	.679	.374**	.569**	.446**	.420**	.523**	.449**	.449**	.356**	.487**	
Scale1	4.34	.577	.685**	.770**	.709**	.719**	.755**	.767**	.694**	.683**	.761**	.685**

**Statistical significance $p = 0.001$.

Scale2 'Necessary skills, knowledge for coping with the elderly and people with special needs' includes 7 questions (questions 11 to 17). The mean of the variable of Scale2 was 4.30 (86.0%) and standard deviation 0.558. It has strong uphill linear relationships with questions 12, 14 and 15. This means that respondents understand the importance of having a relevant skills and knowledge for coping with the elderly and people with special needs. There is moderate positive correlation at significance level p<001 between questions 14 and 15, which shows that respondents who have high skills in problem solving tend to know how to motivate elderly patient to try to manage his/her activities independently. In summary, the correlation presented in Table 8 shows that all questions have significance in relation to Scale2.

Scale6 'Commitment to safety' was measured in the questionnaire by 6 questions (questions 26 to 31) (Table 9). The mean of the variable of Scale6 was 4.33 (86.6%) and standard deviation 0.63. We found strong uphill linear relationships with questions 29, 27 and 28, which shows that respondents appreciate their participation and involvement in safety activities as well as the ability to discuss safety issues with management. The most significant correlation was found between questions 28 and 29 (r = .768) at significance level 0.01, which shows that respondents value the management willingness to discuss safety issues. In those cases, workers are motivated eagerly to inform about safety problems as well as to propose safety measures in order to deal with them. This is in line with the study conducted by DeJoy et al. (2017), which has clearly demonstrated that many occupational health problems are generally related to organizational factors.

Akroyd et al. (2007) have addressed the necessary core commitment factors, for example, perceived level of organizational support, management commitment, role of clarity and level of education. According to Farokhzadian et al. (2015), senior managers are responsible for safe working environment, promoting safety and quality care in healthcare organizations.

Table 8. Results of selected variables included into Scale2 'Necessary skills, knowledge for coping with the elderly and people with special needs' of the caregivers' professional competences

Questions/Keywords	Mean	SD	11	12	13	14	15	16	17
11. patients' coping	4.31	.741							
12. patients' daily life support	4.51	.640	.602**						
13. recognition of health problems	4.38	.709	.577**	.580**					
14. patient's problem solving	4.22	.707	.559**	.546**	.637**				
15. patient's independent	4.29	.729	.495**	.509**	.593**	.609**			
16. using the special equipment	4.22	.773	.455**	.571**	.403**	.504**	.515**		
17. work ergonomics	4.19	.830	.407**	.447**	.349**	.348**	.443**	.600**	
Scale2	4.3	.558	.765**	.787**	.768**	.781**	.780**	.767**	.691**

**Statistical significance $p = 0.001$.

Table 9. Results of selected variables included into Scale6 'Commitment to safety' of the caregivers' professional competences

Questions	Questions							
	Mean	SD	26	27	28	29	30	31
26 patients' safety discussions	4.31	.820						
27 safety communications	4.31	.816	.505**					
28 managers discussions	4.29	.861	.343**	.515**				
29 safety proposals	4.27	.816	.397**	.610**	.768**			
30 availability of equipment	4.10	.894	.402**	.512**	.476**	.482**		
31safety trainings	4.29	.834	.445**	.430**	.374**	.373**	.470**	
Scale6	4.33	.634	.684**	.793**	.777**	.807**	.761**	.685**

**Statistical significance $p = 0.001$.

In the analysis of relationships between specific statements, we found a few significant correlations (at significance level $p = 0.001$). The strongest correlations were found between questions 9 (Scale1) and 12 (Scale2) (r = .576), 15 (Scale2) and 17 (Scale2) (r = .559). These relationships mean that if respondents estimate their knowledge and skills highly, they provide good instructions of how to take care of

patient's regular needs, provide advice and instructions to the patient´s families as well as support and encourage patients with coping in daily life. In addition, respondents also estimate that they have good knowledge about ergonomics and how to do their job safely. Similarly, there is significant correlation between questions 10 (Scale1) and 12 (Scale2) (r = .546). According to the results, caregivers and nurses who are confident in their knowledge and skills to provide patients' hygiene, and do it safely and effectively, believe that they are also able to provide patients with good instructions for their daily activities.

Previous studies have extensively reported the numerous aspects related to competent and trained employees, such as better safety and health knowledge, skills and experiences (Chang et al., 2012). Additionally, educated and well trained employees tend to discuss safety issues with co-workers more frequently. They also have a better work process across time and better communication and information flow; in addition, they are good in coordinating problems (Horwitz et al., 2009). Another study (Koohi et al., 2013) has demonstrated that trained employees are more committed to organizations and more interested to become involved in the activities beyond their common and pre-determined duties. Our study confirms these previous findings.

In addition, our study showed that training programmes for professional caregivers and nurses should include more extensive knowledge about the general scope of the healthcare system to support competent advice in patients' social, rehabilitation and health services. In addition, more effective training is required how to provide adequate help in emergency situations.

Based on the results of our study, it is required to integrate human factors in safety management of nursing homes with a special focus on adequate safety training and development of necessary skills and knowledge of workers. We also emphasize the need to include the topic of patient safety and worker ergonomics into the national occupational standard as well as in vocational training programs/curriculum. Resulting from our study, we stress the importance of in-service trainings about specific occupational safety issues (e.g., how to use special equipment ergonomically). This would enhance employees' ability to cope successfully with the elderly and people with special needs, to provide safe and high-quality care, to stay confident and to manage conflicts in order to keep good relationships at work.

CONCLUSIONS

The results of our study prove that workers' knowledge, skills and beliefs are essential components for safety and quality in patient care. Resulting from the survey, we can conclude that employees with higher awareness of their professional competence have also higher estimations about their skills and knowledge for coping with the elderly and people with special needs. Respondents who highly estimate their knowledge and skills in living quests and patient care, skills and knowledge for coping with the elderly and people with special needs are also more confident and prepared to provide emergency first aid. We also found that respondents with higher estimation of their professional knowledge are more confident in communication and are able to solve work-related conflicts.

Our results reveal that caregivers and nurses who have high estimation of their skills and knowledge are more committed to safety. We found that respondents who have sufficient knowledge and skills required for their work are more likely to participate in health and safety activities, to discuss topics about occupational safety with co-workers as well as with management. Care givers and nurses who participated in our study emphasized the importance of management commitment to safety in order to be confident to discuss safety problems, suggest safety measures and improvement of working environment. Complementing the national standard with recommended issues (to include safety topic into the curriculum and organize the in-service training) will allow improvement of safety knowledge among caregivers and nurses and will demonstrate that patients' and occupational safety is a priority in all duties in healthcare. We suggest that HFE should be integrated into the in-service training activities in order to enhance safety performance and quality of patient care.

ACKNOWLEDGEMENTS. The acknowledgements should include all people and institutions that have helped to achieve the goals of the research but have not been mentioned as authors.

Funding
This research received funding by Tallinn Health Care College (project Proactive safety management in health care no 1-16/61) in cooperation with Tallinn University of Technology.

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